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Original research article

Aetiology and risk factors of atrial fibrillation among patients admitted in tertiary teaching hospital of Bengaluru

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Abstract

Background: Atrial fibrillation (AF) is the most common and persistent cardiac arrhythmia in clinical practice, with an overall prevalence in the world is estimated to be 0.47%, but there is significant regional variation and has various predisposing factors and causes.

Methodology: A descriptive study was undertaken in Tertiary teaching hospital Bengaluru. Study population was considered from in-patients of all the departments of the hospital. A pretested Semi structured questionnaire was administered on study subjects.

Results: Most of the study participants were aged above 60 years, with slight male 33(55%) preponderance compared to female 27(45%). The most common underlying comorbidity was Rheumatic heart disease 26(43.3%) and among rheumatic heart disease, mitral stenosis was the most common valvular lesion observed i.e. 15 cases out of 26 cases. 29% of study participants with atrial fibrillation belonged to normal category in BMI range according to South East Asian region but 25% of them where in Obese 1 category. Underlying heart condition i.e. 60 (100%) and obesity 38 (61.3%) were most commonly seen Risk factors among study participants.

Conclusion: Atrial fibrillation is seen to increase in prevalence with advancing age.

No significant difference was found with respect to gender, the ratio of male: female is 55:45.

Rheumatic valvular heart disease was the most common etiology of atrial fibrillation observed in the present study. The number of patients with AF is predicted to rise steeply in the coming years hence early identification and management has to be done. Health education has to be given to population.

Keywords: Atrial fibrillation, etiology, risk factors

Introduction

Atrial fibrillation (AF) is the most common and persistent cardiac arrhythmia in clinical practice, with an overall prevalence in the world is estimated to be 0.47%, but there is significant regional variation [1]. Atrial fibrillation (AF) is associated with a wide variety of predisposing factors. In the developed world, the most common clinical diagnoses associated with permanent AF are hypertension and coronary artery disease. The presence of congestive heart failure markedly increases the risk of AF. The prevalence of AF in the adult population doubles with each advancing decade of age, from 0.5% at age 50-59 years to 9% at age 80-89 years [2].

Contemporary studies show that 20-30% of patients with an ischemic stroke have AF diagnosed before, during, or after the initial event [3]. AF is often associated with other cardiovascular diseases, including hypertension; heart failure; diabetes-related heart disease; ischemic heart disease; and valvular, dilated, hypertrophic, restrictive, and congenital cardiomyopathies [4].

The prevalence of AF is 0.1% in persons younger than 55 years, 3.8% in persons 60 years or older, and 10% in persons 80 years or older.

In India, most common age group having Atrial Fibrillation was between 31-50 years, which indicates that the incidence of Atrial Fibrillation in India is significantly high in younger age group as compared to Western countries, where AF is more common in old age [5]. The incidence of AF is significantly higher

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in men than in women in all age groups [6].
AF appears to be more common in white individuals than in black persons, with black individuals have less than half the age-adjusted risk of developing AF. In 10-15% of cases of AF, the disease occurs in the absence of comorbidities. According to sex, incidence of atrial fibrillation was higher amongst Female (58%) than in Male (42%) as compared to western countries, where AF is more common in male. The Male: Female ratio being 1:1.38 most common cause of AF was Rheumatic heart disease (78%), as compared to Western countries, where IHD is the most common cause of AF.
In the Framingham Study, atrial fibrillation developed in 49 men and 49 women. The incidence rose sharply with age but did not differ significantly between the sexes. Overall, there was a 2.0 per cent chance that the disorder would develop in two decades. Atrial fibrillation usually followed the development of overt cardiovascular disease. Only 18 men and 12 women (31 per cent) had chronic atrial fibrillation in the absence of cardiovascular disease [7].

Etiology of Atrial Fibrillation
The majority of patients with AF have hypertension (usually with left ventricular hypertrophy) or some other form of structural heart disease. In addition to hypertensive heart disease, the most common cardiac abnormalities associated with AF are ischemic heart disease mitral valve disease, hypertrophic cardiomyopathy, and dilated cardiomyopathy. Less common causes of AF are restrictive cardiomyopathies such as amyloidosis, constrictive pericarditis, and cardiac tumors. Severe pulmonary hypertension often is associated with AF.
Obesity and obstructive sleep apnea are associated with each other, and both have been found to independently increase the risk of AF. Available data suggest that atrial dilation and an increase in systemic inflammatory factors are responsible for the relationship between obesity and AF. The possible mechanisms of AF in patients with sleep apnea include hypoxia, surges in autonomic tone, and hypertension.

I. Cardiac Causes [8]
i) Rheumatic heart disease.
ii) Ischemic heart disease.
iii) Hypertensive heart disease.
iv) Cardiomyopathies.
v) Pericardial diseases including effusion and constrictive pericarditis.
vi) Congenital heart diseases like atrial septal defect.
vii) Sick sinus syndrome.
viii) Pre-excitation syndrome, e.g.: Wolff-Parkinson-White syndrome.
ix) Atrial myxomas.

II. Non-Cardiac Causes
i) Thyrotoxicosis.
ii) Excess alcohol intake.
iii) Bronchogenic carcinoma.
iv) Acute infections like pneumonia.
v) Postoperative problems especially after thoracotomy and coronary artery bypass
vi) Corpulmonale.

III. Lone Atrial Fibrillation
Non-Modifiable Risk Factors
Gender
In both developed and developing countries, the age-adjusted incidence and prevalence of AF are lower in women, while the risk of death in women with AF is similar to or higher than that in men with AF [9]. Female AF patients who have additional stroke risk factors (particularly older age) are also at greater risk than men of having a stroke [10], even those anti-coagulated with warfarin. Women with diagnosed AF can be more symptomatic than men and are typically older with more comorbidities [11]. These observations highlight the need to offer effective diagnostic tools and therapeutic management equally to women and men.

Genetic predisposition
AF, especially early-onset AF, has a strong heritable component that is independent of concomitant cardiovascular conditions [12]. A few young AF patients suffer from inherited cardiomyopathies or channelopathies mediated by disease-causing mutations. These monogenic diseases also convey a risk for sudden death. Up to one-third of AF patients carry common genetic variants that predispose to AF, albeit with a relatively low added risk. At least 14 of these common variants, often single nucleotide polymorphisms, are known to increase the risk of prevalent AF in populations [13].

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 08, 2024

Alcohol and Atrial Fibrillation
Heavy alcohol use predisposes to acute atrial fibrillation.

Obesity and Weight Loss
Obesity increases the risk for AF with a progressive increase according to body mass index (BMI). Obese patients may have more LV diastolic dysfunction, increase sympathetic activity and inflammation, and increase fatty infiltration of the atria. Obesity may also be a risk factor for ischaemic stroke, thrombo-embolism, and death in AF patients [14].

Underlying Disease Conditions
Heart Failure
Heart failure and AF coincide in many patients. Heart failure and AF can cause and exacerbate each other through mechanisms such as structural cardiac remodelling, activation of neurohormonal mechanisms, and rate-related impairment of left ventricular (LV) function. Worse prognosis, including increased mortality.
Heart failure was the commonest condition associated with the chronic AF and was the cause of hospitalization in almost fifty percent of cases [15].
The Rotterdam Study highlighted the presence of an unrecognized myocardial infarction is associated with a twofold increased risk of atrial fibrillation in men, independent of known cardiovascular risk factors [16].

Hypertension
Hypertension is a stroke risk factor in AF; uncontrolled high blood pressure enhances the risk of stroke and bleeding events and may lead to recurrent AF [17].

Valvular Heart Disease
Valvular heart disease is independently associated with incident AF [18]. Approximately 30% of patients with AF have some form of valvular heart disease, Valvular heart disease can be associated with an increased thrombo-embolic risk, which probably also adds to the stroke risk in AF patients. Most common cause of AF was Rheumatic heart disease (78%), as compared to Western countries, where IHD is the most common cause of AF [5].

Diabetes Mellitus
Diabetes and AF frequently coexist because of associations with other risk factors [20]. In patients with AF, a longer duration of diabetes appears to confer a higher risk of thrombo-embolism, albeit without greater risk of OAC-related bleeding.

Chronic Obstructive Pulmonary Disease, Sleep Apnoea and Other Respiratory Diseases
AF has been associated with obstructive sleep apnoea. Multiple pathophysiological mechanisms can contribute to AF in obstructive sleep apnoea, including autonomic dysfunction, hypoxia, hypercapnia, and inflammation [21].

Chronic Kidney Disease
AF is present in 15-20% of patients with CKD. The definition of CKD in most AF trials is relatively strict. Although an estimated creatinine clearance (CrCl) rate of, 60 mL/min is indicative of CKD, a number of trials in AF patients have used CrCl, 50 mL/min to adapt NOAC (Newer oral anticoagulants) dosage, usually estimated using the Cockroft-Gault formula. CrCl in AF patients can deteriorate over time.
Hence this study was conducted to assess Aetiological factors and Risk factors responsible for AF in our hospital which would help in identifying patients with AF early and thereby preventing or minimizing its devastating complications and decrease burden for the family.

Methodology
A descriptive study was conducted in Tertiary teaching hospital Bengaluru after takin Ethical clearance from institutional ethical committee. Duration of the study was for a period of 1 year (06/2015 TO 05/2016). Study population was considered from in-patients of all the departments of the hospital. All the individual who are aged >18 years admitted with atrial fibrillation confirmed with 12 lead ECG and Echocardiogram and who have given informed consent were included in the study. A pretested Semi structured questionnaire was administered on study subjects. Patients who were not able to verbalize symptoms and whose investigations were not available at the time of the study were excluded. Study sample is calculated as 60 considering prevalence of atrial fibrillation as 2.3 - 3.4% according to study done by Jocasta *et al*. 90 and using the formula:

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 08, 2024

$$n = \frac{Z^2_{(1-\alpha/2)} \times P(1-P)}{d^2}$$

Statistical Tests: All the data is collected and entered in MS excel. Qualitative variables were expressed in frequencies and percentages and quantitative variables were expressed as Means and Standard Deviation. Suitable tests of Significance like Chi-Square tests, Spearmen's correlation test. The data was then analysed using SPSS [Statistical Package for Social Sciences] software v.21.0.

Results

In this study it was seen that the most of study participants were aged above 60 years (Fig 1), with slight male 33(55%) preponderance compared to female 27(45%) (Table 1).

The most common underlying comorbidity was Rheumatic heart disease 26(43.3%) and among rheumatic heart disease, mitral stenosis was the most common valvular lesion observed i.e. 15 cases out of 26 (Fig 2).

29% of study participants with atrial fibrillation belonged to normal category in BMI range according to South East Asian region but 25% of them where in Obese 1 category (Fig 4). Underlying heart condition i.e. 60 (100%) and obesity 38 (61.3%) were most commonly seen risk factors among study participants.

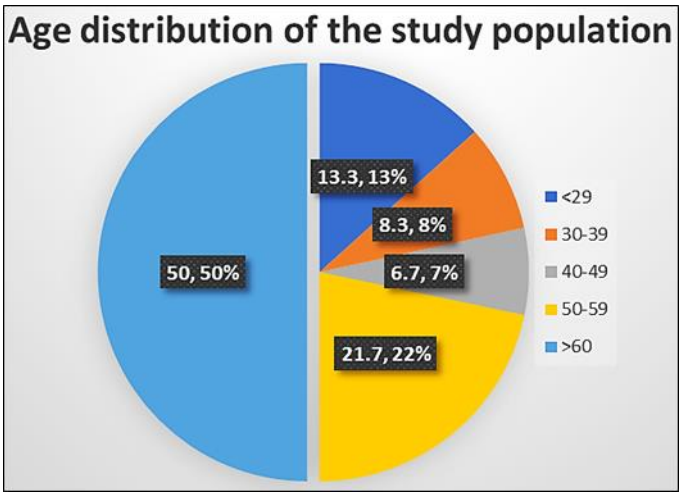

Fig 1: Pie chart depicting Age-wise distribution of the study participants

In the present study, the minimum age of the study population was 22 and the maximum age was 85 years. The median age of the study population was 59[41.0-66.8] years. The youngest patient was 22 years old and oldest patient was 85 years old. About 30(50%) of cases were seen were aged more than 60 years.

Table 1: Sex-wise distribution of the study population

Table showing the sex wise distribution of the study population			
Age group	**Sex**		**P value***
	Male n (%)	**Female n (%)**	
<29	5(15.2)	3(11.1)	0.846
30-39	2(6.1)	3(11.1)	
40-49	2(6.1)	2(7.1)	
50-59	6(18.2)	7(25.9)	
>60	18(54.5)	12(44.4)	
Total	33(100.0)	27(100.0)	
*- Chi-square test			

The male to female ratio was almost equal with slight male preponderance with 33(55%) male and 27(45%) female cases. age and gender distribution wise, more male patients were found to have AF compared to females after 60 years however, the age wise distribution of males and females did not differ significantly.

The most common underlying comorbidity was Rheumatic heart disease 26(43.3%) followed by ischemic heart disease 22(36.7%) and hypertension 22(36.7%), Type II Diabetes mellitus 9(15.0%) and hypertension and type II diabetes Mellitus in 3(5.0%) of the study population.

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 08, 2024

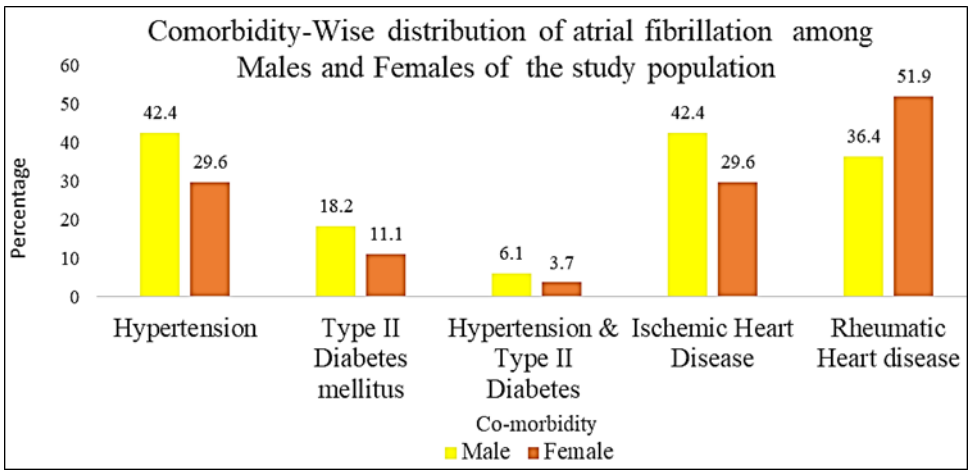

Fig 2: Bar chart depicting Co-morbid conditions seen in Individuals (Males and Females) presenting with atrial fibrillation

The most common co-morbidity among female study population was Rheumatic heart disease 14(51.9%) whereas the most common co-morbidities seen in male study population was ischemic heart disease 14(42.4%) and hypertension 14(42.4%) respectively.
However no significant differences were observed in the proportion of underlying comorbidities of hypertension, type II diabetes mellitus, ischemic heart disease and rheumatic heart disease among males and females in the study population.

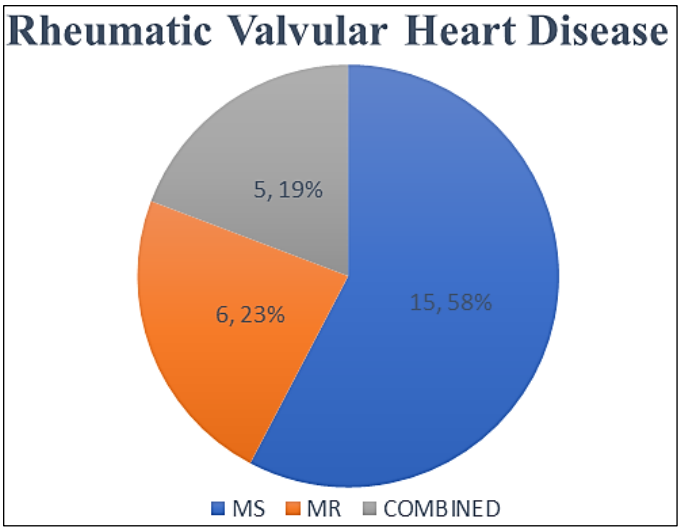

Fig 3: Pie chart depicting distribution of study population on the basis of valvular lesions of Rheumatic heart disease

Among rheumatic heart disease, mitral stenosis (MS) was the most common valvular lesion observed, 15 cases out of 26 (56%), mitral regurgitation (MR) was 6 cases (23%), and combined valvular lesions contributed for 5(21%) cases.
In the study population, 21(35.0%) were current smokers and 15(25.0%) currently were consuming alcohol.

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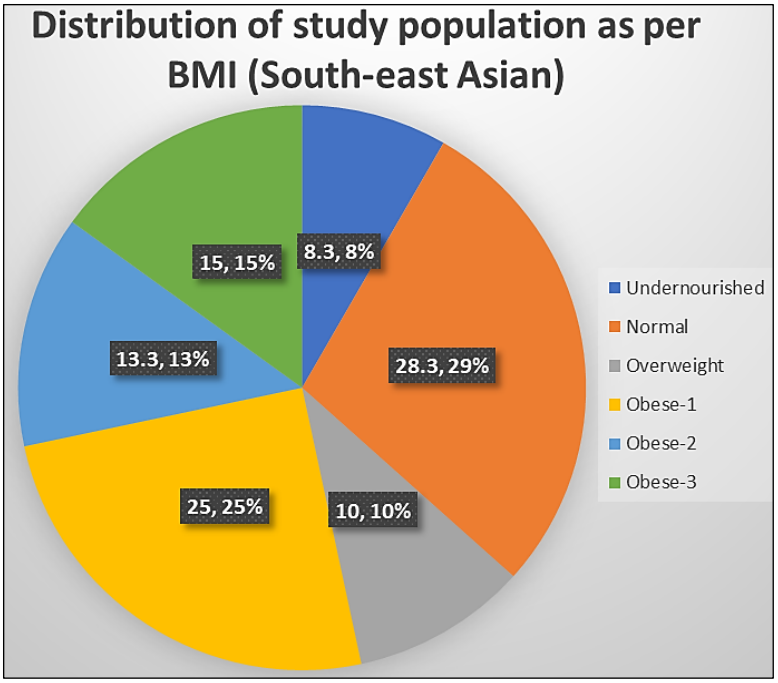

Fig 4: The Pie chart shows the distribution of the study population as per BMI

The following pie diagram depicts the distribution of the study population as per South East Asia classification. 29% of study participants were belonging to normal category but 25% of them in Obese 1 category.

Table 2: Risk factors and heart related conditions that could have led to atrial fibrillation

Sl. No.	Risk factors	Total n(%)
1.	Age more than 60	23(38.3)
2.	Sex-Male	33(55.0)
3.	Underlying cardiac comorbidities	60(100.0)
4.	Obesity and overweight	38(61.3)
5.	Thyrotoxicosis	0(0.0)

In this study it was seen that sex-male, underlying heart comorbidities and obesity/overweight was were more prone for atrial fibrillation.

Table 3: The following table shows the distribution of Sex wise distribution of study population as per heart conditions

Table showing sex wise Heart related conditions in the study population					
Sl. No.	Heart related conditions	Male n(%)	Female n(%)	Spearman's Rho	P value
1.	Rheumatic heart disease	12(36.4)	14(51.9)	-0.155	0.235
2.	Ischemic heart disease	14(42.4)	8(29.6)	0.132	0.314
3.	Congestive cardiac failure	4(12.1)	7(25.9)	-0.177	0.175
4.	Cerebrovascular accident	1(33.3)	2(66.7)	-0.100	0.448
# statistical significance at 0.05					

The heart related conditions as per sex distribution shows that in our study population they were negatively correlated for Rheumatic heart disease, Congestive cardiac failure and cerebrovascular accident and positively correlated with presence of ischemic heart disease. However, these correlations were not found to be statistically significant.

Table 4: Age group wise distribution Heart related conditions of study population

Table showing age group Heart related conditions in the study population					
Sl. No.	Heart related conditions	Age less than 60 n (%)	Age more than 60 n (%)	Spearman's Rho	P value
1.	Rheumatic heart disease	24(64.9)	2(8.7)	0.149	0.256
2.	Ischemic heart disease	5(13.5)	17(73.9)	-0.099	0.451
3.	Congestive cardiac failure	10(27.0)	1(4.3)	-0.062	0.640
4.	Cerebrovascular accident	2(5.4)	1(4.3)	-0.030	0.821

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 08, 2024

statistical significance at 0.05

The heart related conditions as per age group distribution shows that in our study population they were negatively correlated for ischemic heart disease, Congestive cardiac failure and cerebrovascular accident and positively correlated with presence of Rheumatic heart disease. However, these correlations were not found to be statistically significant.

Discussions

Aetiology of Atrial Fibrillation

Classifying the patients according to Aetiology, the most common underlying comorbidity was Rheumatic heart disease 26(43.3%) followed by ischemic heart disease 22(36.7%) and Hypertension 22(36.7%), Type II Diabetes mellitus 9(15.0%) and hypertension and type II Diabetes Mellitus in 3(5.0%) of the study population.

The most common co-morbidity among female study population was Rheumatic heart disease 14(51.9%) whereas the most common co-morbidities seen in male study population was ischemic heart disease 14(42.4%) and hypertension 14(42.4%) respectively.

However no significant differences were observed in the proportion of underlying comorbidities of hypertension, type II diabetes mellitus, ischemic heart disease and rheumatic heart disease among males and females in the study population.

The Framingham study identified rheumatic heart disease and cardiac failure as the most predictive precursor of atrial fibrillation. Hypertensive heart disease was the most common precursor, but the risk ratio for this disorder was not as great as for chronic rheumatic heart disease or cardiac failure. Coronary artery disease was found to be less striking and more inconsistent risk factor for the arrhythmia, except for the paroxysmal form of atrial fibrillation which showed strong relationship with newly developed coronary events [4].

Krijthe BP *et al*. Study concluded that during a mean follow-up of 11.7 years, 329 men and 398 women developed atrial fibrillation. Unrecognized myocardial infarction was associated with a two-fold risk of developing atrial fibrillation in men compared to men without a history of myocardial infarction, independent of age, and cardiovascular risk factors. In women, unrecognized myocardial infarction was not associated with atrial fibrillation [16].

Makwana A *et al*. Study concluded that Rheumatic valvular heart disease is the most common etiology of atrial fibrillation observed in the present study. Mitral stenosis is the commonest valvular lesion among rheumatic heart diseases [19].

Dushyant *et al*. study concluded that most common cause of AF was Rheumatic heart disease (78%), as compared to Western countries, where IHD is the most common cause of AF. The time interval between onset of symptoms of rheumatic fever and presentation of symptomatic RHD is relatively short in India. The average age of patient having RHD developing AF, in India is 15-20 years earlier than patients from western countries. Non rheumatic etiology group (22%) included IHD, Cardiomyopathy, Hypertension, COPD and Thyrotoxicosis [5].

Rheumatic Heart Disease

In present study isolated cases of MS seen in 14 patients (58.3%), MR cases were seen in 5 patients (20.8%), MS and MR seen in 3 patients (12.5%) cases, MS with AR (Aortic Regurgitation) cases were seen in 2 patients (8.3%). The above findings are comparable with Kumar S *et al*. [95] study where MS seen in 28.57%, MS and MR seen in 11.42% cases.

Makwana A *et al*., study concluded that Rheumatic valvular heart disease is the most common etiology of atrial fibrillation observed in the present study. Mitral stenosis is the commonest valvular lesion among rheumatic heart diseases [19].

In Gadwalkar *et al*., study, out of 25 cases of RHD 14 cases were pure MS, 5 cases were MR with MS, 2 cases were MR, 1 case was MR with AR, 1case with MR, MS, AR, 1 case of AS with AR. Even though there were very less cases of AR or AS causing AF other findings were comparable with present study [22].

Risk Factors

The risk factors which could have contributed to the development of atrial fibrillation like smoking, alcohol consumption were noted in the present study.

In the present study, history of smoking was present in 21 (34%) cases, while history of alcohol consumption was present in 15(25%) cases out of total 60 cases of atrial fibrillation.

In Trivedi *et al*., history of smoking & alcohol consumption was present in 11(22%) & 8(16%) cases respectively out of total 50 cases of atrial fibrillation [19].

Conclusion

Atrial fibrillation is seen to increase in prevalence with advancing age.

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 08, 2024

No significant difference was found with respect to gender, the ratio of male: female is 55:45.
Rheumatic valvular heart disease was the most common etiology of atrial fibrillation observed in the present study. Mitral stenosis was the most common dominant lesion causing AF among valvular heart disease. The number of patients with AF is predicted to rise steeply in the coming years hence early identification and management has to be done. Health education has to be given to population.

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